



SERVICE MANUAL

R-600 COMMUNICATIONS RECEIVER



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CIRCUIT DESCRIPTION

< RX UNIT >

The R-600 is an hf general coverage, triple conversion receiver with a first, second, and third intermediate frequency of 40.455 MHz, 10.455 MHz, and 455 kHz. It is provided with two antenna input terminals which are common to all bands. One terminal is provided for a low-Z (50 Ω) antenna, and the other is for a high-Z (500 Ω) antenna. The antenna input signal flows through a 100 mA fuse and a switchable 20 dB RF attenuator, and then enters the Band Pass Filter (BPF) group. A separate BPF is provided for each of six bands; 0.15 to 1 MHz, 1 to 2 MHz, 2 to 4 MHz, 4 to 8 MHz, 8 to 17 MHz, and 17 to 30 MHz. A low pass filter common to all bands above 2 MHz is used to reject unwanted broadcast band interference (L39, 40, 41).

Exiting the BPF's, the signal flows through Q1, a 3SK73(GR) RF amplifier operating in the 150 kHz to 30 MHz range, with approximately 15 dB gain, and then through a 40.455 MHz i-f trap. The signal is buffered by Q2, a 2SC1815(Y) emitter follower, and then enters the first mixer. Q3 and Q4, two 3SK73(GR) FET's constitute a balanced mixer in which the incoming signal is mixed with the VCO (voltage-controlled oscillator) output from the PLL (phase-locked loop) circuit to produce the first i-f signal at 40.455 MHz. The first i-f signal is filtered through T4 ~ T7.

The signal then enters Q5 and Q6, 2SK19(GR), the second balanced mixer. Here, the signal is converted to the second i-f at 10.455 MHz by a mix with the 30 MHz HET (heterodyne) signal from the PLL circuit.

After passing through F1, a 10.455 MHz ceramic filter, the second i-f then enters Q7, 3SK73(GR), the third mixer. Here, the signal is converted to the third i-f at 455 kHz by mixing with the 10 MHz HET output from the PLL.

This third i-f signal flows through the noise blanker gate D13, D14, 1S1587 diodes, then F2 (6 kHz) or F3 (2.7 kHz) 455 kHz ceramic filters. The noise blanker, which is designed to operate on ignition noise and similar pulse-type noises, samples the i-f signal from Q7 through a tap on the secondary of output transformer T10. All transistors in this circuit are 2SC1815(Y). Q22 buffers the i-f signal for differential amplifiers Q23, 24. Q25 amplifies this for detectors D28, 29 1N60's. The detector output is DC amplified by Q26 to drive the noise blanker gate diodes D13, 14. D30, MV-13 varistor, breaks-over at noise blanker switch ON for pulse-type signals. Q27 is the noise blanker AGC, which allows this circuit to differentiate between signal (slow rise-time) and unwanted noise (fast rise-time). Filter output is amplified by Q8 and Q9, 3SK73(GR), the two-stage third i-f amplifier. The amplifier output enters either the AM or SSB product detectors.

The AM Detector D25, 1N60, receives its signal through buffer amplifier Q10, 2SC1815(Y) and exits through emitter follower Q11, 2SC2240(GR). For SSB reception, the i-f signal is product-detected by diodes D19 ~ 22, 1N60's. Carrier is developed by oscillator Q16, 2SC1815(Y) and buffered by Q17, 2SC1815(Y). LSB (lower sideband) shift is provided by switch transistor Q15, 2SC1815(Y). AGC is detected by diodes D26, 27, 1N60's, and is amplified by Q18, 2SC1815(Y) (for Q1, 8, 9) and further amplified (for Q1, 3, 4 and 7) by Q19, 2SK19(GR). Q20, 2SA1015 is the S-meter amplifier. The AGC time-constant is increased in the SSB modes by switch transistor Q21, 2SC1815(Y), which adds C147 (1 μ F) and R139 (10

k Ω) to increase the AGC hold-time.

In AM wide reception, F2 (6 kHz) is used, while F3 (2.7 kHz) is employed for AM narrow and SSB mode reception. The choice of detectors and filters is diode-switch selected at mode change. SSB product detector output is switched by D23, AM detector output by D24, both 1S1555's. Filter F2 is switched by D15 and D17, 1S1007's, while F3 is switched by D16 and D18, 1S1587's.

The detector outputs are amplified by Q12, 2SC2240(GR). This signal proceeds through the Tone and Gain controls before being amplified by Q14, HA1368R power amplifier. The output of this last stage drives the speaker or phones. Additionally, the output of Q12 is further amplified by Q13, 2SC2240(GR), which provides a 300 mV (nominal) signal to the Record terminal.

Q28, 2SC1957(Y) is a 12 volt ripple filter, and Q29, NJM78M09A is the 9 volt AVR (automatic voltage regulator). These stabilize the receiver DC voltages form the main power supply on the PLL unit. The 9 volt output line is also returned to the PLL unit.

Electrical Performance

Item	Rating
Nominal center frequency	455 kHz
6 dB band width	± 3 kHz or more (from 455 kHz)
50 dB band width	± 9 kHz or less (from 455 kHz)
Ripple (within 455 ± 2 kHz)	2 dB or less
Insertion loss	6 dB or less
Guaranteed attenuation (within 455 ± 100 kHz)	60 dB or more
I/O matching impedance	2.0 k Ω

Table 1 Ceramic filter (L72-0319-05, RX UNIT F2)

Electrical Performance

Item	Rating
Center frequency (3dB band width center point)	10.455 MHz ± 50 kHz
3 dB band width	150 ± 40 kHz
20 dB band width	380 kHz or less
Insertion loss Formula $20 \log \frac{E1}{2E2}$	9 dB or less
Spurious attenuation (within 10.455 ± 2 MHz)	40 dB or more
Attenuation at 9.545 MHz	47 dB or more
I/O matching impedance	330 Ω

Table 2 Ceramic filter (L72-0331-05, RX UNIT F1) AM-W

Electrical Performance

Item	Rating
Center frequency	455 kHz ± 0.6 kHz
6 dB band width	2.8 ± 0.3 kHz
40 dB band width	5.5 kHz or less
Insertion loss (at maximum output)	6.0 dB or less
Guaranteed attenuation (within 455 ± 100 kHz)	60 dB or more
Spurious attenuation (within 0.1 to 1.0 MHz for 600 to 700 kHz)	40 dB or more 40 dB or more
I/O matching impedance	2.0 k Ω

Table 3 Ceramic filter (L72-0332-05, RX UNIT F3) SSB, AM-N

CIRCUIT DESCRIPTION

<PLL UNIT>

The R-600 PLL circuit consists of three VCO's. The reference oscillator frequency is 10 MHz, developed by 10 MHz quartz crystal X1 and oscillator Q9, 2SC1815(Y). A 1 MHz frequency is used for PLL phase comparison. The frequency counter uses a 1.25 MHz frequency.

The 30 and 40 MHz receiver mixer injection frequencies are multiplied from the 10 MHz master oscillator. Oscillator Q9's output is buffered by Q10, 2SC1815(Y) and divided 1/10 by Q11, SN74LS90N to supply a 1 MHz reference signal to Q12, MC4044P, the phase detector. The PLL includes the VFO (variable frequency oscillator) circuit, which covers 3.545 ~ 4.545 MHz, a 1 MHz range. Also contained in the PLL is the frequency counter and display drivers for the digital frequency readout.

Each of three VCO's are assigned a reception frequency range; 0.15 to 7 MHz receive corresponds to 40.605 to 48.455 MHz VCO-1 output, 8 to 16 MHz corresponds to 48.455 to 57.455 MHz, and 17 to 30 MHz is 57.455 to 70.455 MHz. VCO-1 is comprised of oscillator transistor Q1 2SC1923(O), tuning diode D1 1SV54GC and output switch diode D2 1S1587. VCO-2 and 3 are similar, each with a voltage-controlled tuning diode and output switch diode. The VCO's output for loop phase detection is buffered by Q5, while the output for receiver mixer injection is buffered by Q40 and Q4, 2SC1923(O).

The VFO circuit consists of Q25, 2SK19(Y) oscillator, and a conventional LC tank circuit. Q26, 2SC1815(Y) emitter follower buffers the VFO output. The VFO range is 2.545 ~ 3.545 MHz. Its output is mixed with a 40 MHz signal from buffer Q43, 2SC460 (B) by Q17, SN16913P to produce an output in the range of 36.455 to 37.455 MHz. Note that, as described earlier, this 40 MHz signal is obtained by a 4X multiplication of the 10 MHz master oscillator output. Mixer Q17's output is then filtered, buffered by Q18, 2SK19(GR), and mixed with the VCO output from Q5, 2SC1923(O) buffer by Q19, SN16913P. The output of this mixer is a signal in the 4 ~ 33 MHz range.

Output from Q19 is filtered, buffered by Q20, 2SC1923(O), and amplified by Q21, 2SC1923(O). This is further buffered by Q22, 2SC1815(Y) and Q23, 2SC1959(Y). The signal is then waveform-shaped by Schmitt trigger Q24, SN74S00N and delivered to a programmable counter controlled by the band switch. This counter is comprised of Q31 SN74LS163N, Q32 SN74S112N, Q33 SN74LS00N, and Q34 SN74LS74N, which produces a divided signal with a frequency always at 1 MHz. The output of this divider is used for phase comparison in the PLL circuit by Q12 MC4044P phase comparator, against the 1 MHz reference from Q11 divider.

Any phase difference between the programmable counter output and the 1 MHz reference is detected in Q12, the phase comparator. An error correction voltage, proportional to the phase error between these two signals is output from Q12, and amplified by Darlington Q6 ~ 8, 2SC1775(E). This amplified correction voltage tunes the VCO's by varying the capacitance of voltage-variable diodes D1, 3, or 5 (depending on which VCO is selected). These diodes tune the VCO tank to reduce the error, which keeps the loop locked. The advantage of this system is that all signal processing is done out of the main signal path, and only clean, stable oscillator output is used by the receiver mixer.

The band switch outputs initial data for the programmable counter, the band switching signal for the receiver circuit BPF's, and the VCO selection signal.

In the frequency display circuit, a 40 MHz signal generated by Q16, 2SC1815(Y) and buffered by Q42, 2SC460(B) is mixed with the VCO buffered output from Q41, 2SC1923(O) by Q27, SN16913P to generate a signal in the frequency range of 0.605 ~ 30 MHz. This is filtered, buffered by Q28 2SC1815(Y), amplified by Q29 2SC1923(O), and again buffered by Q30 2SC1815(Y). The signal is waveform shaped by Schmitt trigger Q44 SN74S00N. Q35, MC54408P receives a buffered 10 MHz clock signal through Q13 2SC1815(Y), divides this frequency by 32, and its output enters Q36, M54821P a frequency counter. The output from Q36 is used by Q37 M54521P digit driver and Q38 M54563P segment driver to multiplex the green five digit display LED, SL2504K.

The receiver second mixer local oscillator injection frequency is 30 MHz, obtained by tripling the 10 MHz master oscillator output through buffer Q13, 2SC1815(Y) by Q14, 2SC1815(Y). Local oscillator injection is delivered through buffer Q15, 2SC1815(Y).

The PLL also contains the main power supply circuits: bridge rectifiers D8 ~ 11 VO3C for AC operation, D12 VO3C blocking diode for optional DC operation, and a 5 volt AVR, Q39 μ PC14305 for the PLL TTL circuits.

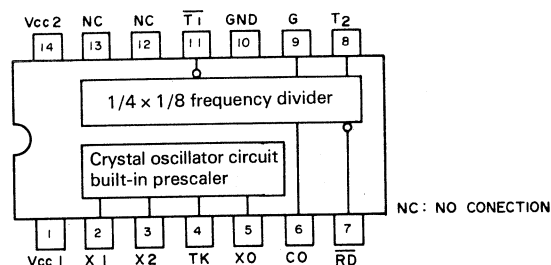


Fig. 1 M54408P Prescaler with crystal Oscillator Circuit

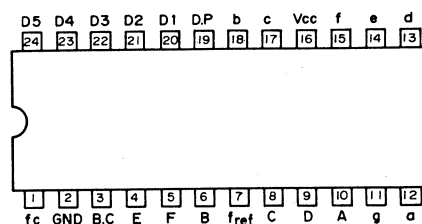
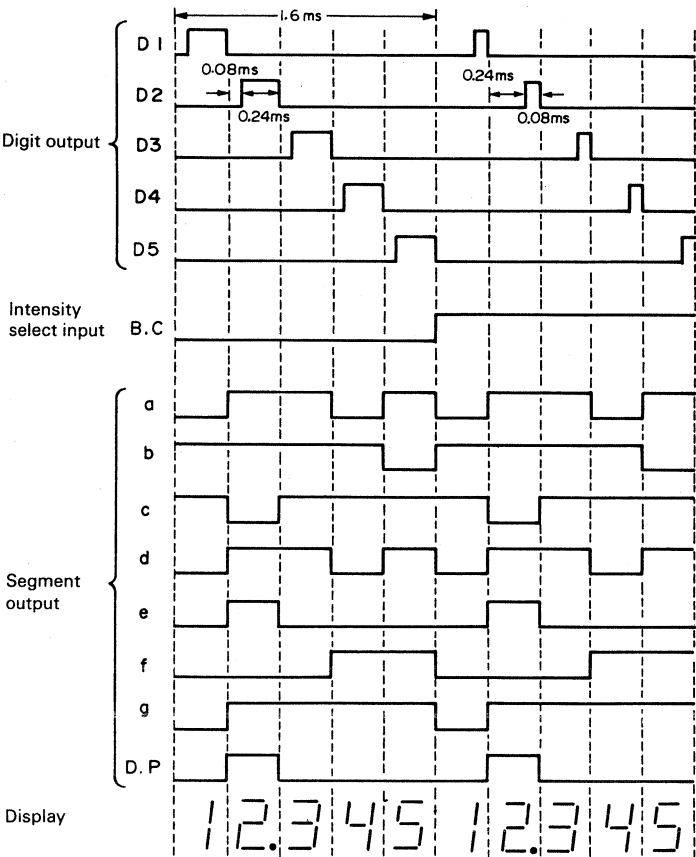


Fig. 2 M54821P Five-Digit Frequency Counter

CIRCUIT DESCRIPTION



When both digit and segment outputs are H, the output turns on.

Fig. 3 M54821P Output Timing Chart

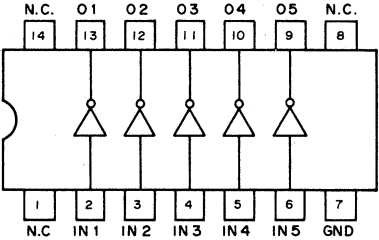


Fig. 5. M54521P 5 Unit 500 mA Transistor Array

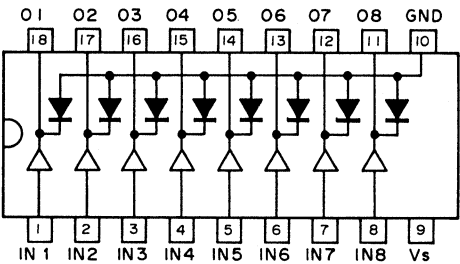


Fig. 6. M54563P 8 Unit Source Type Darlington Transistor Array with Clamp Diode

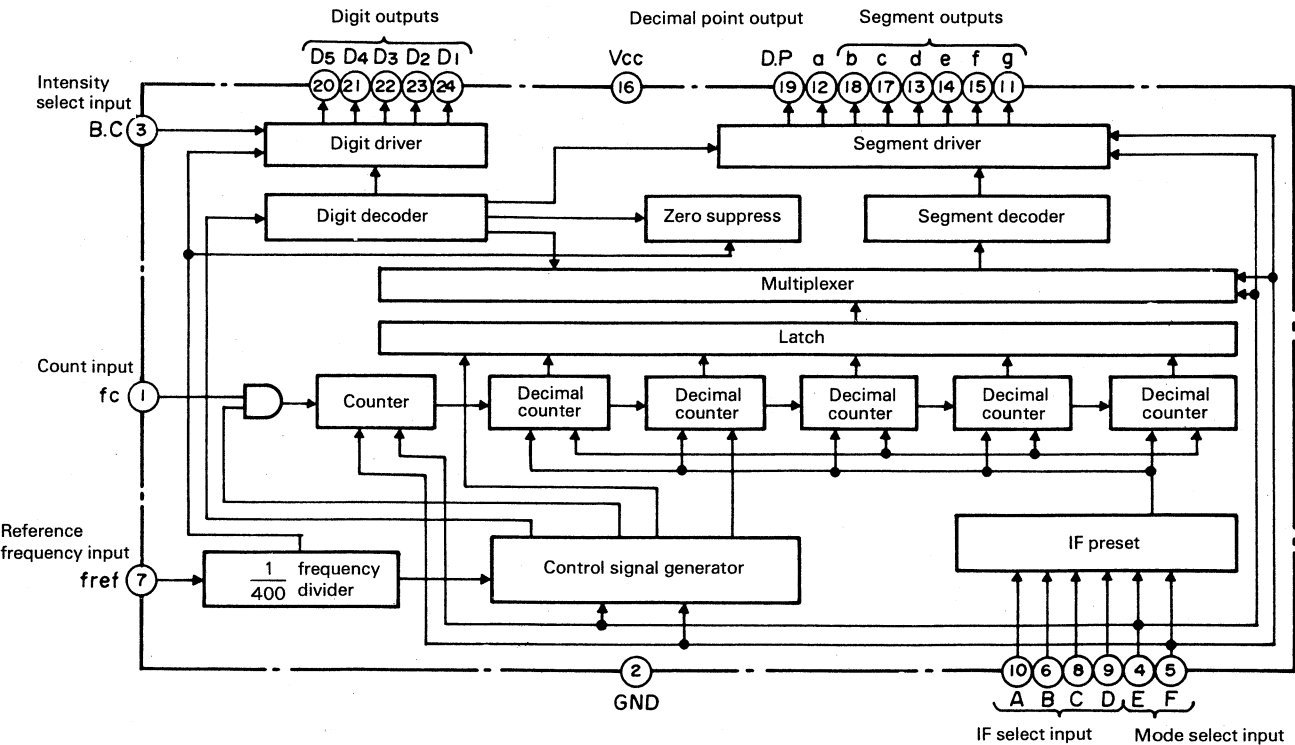


Fig. 4 M54821P Block Diagram

CIRCUIT DESCRIPTION/PACKING

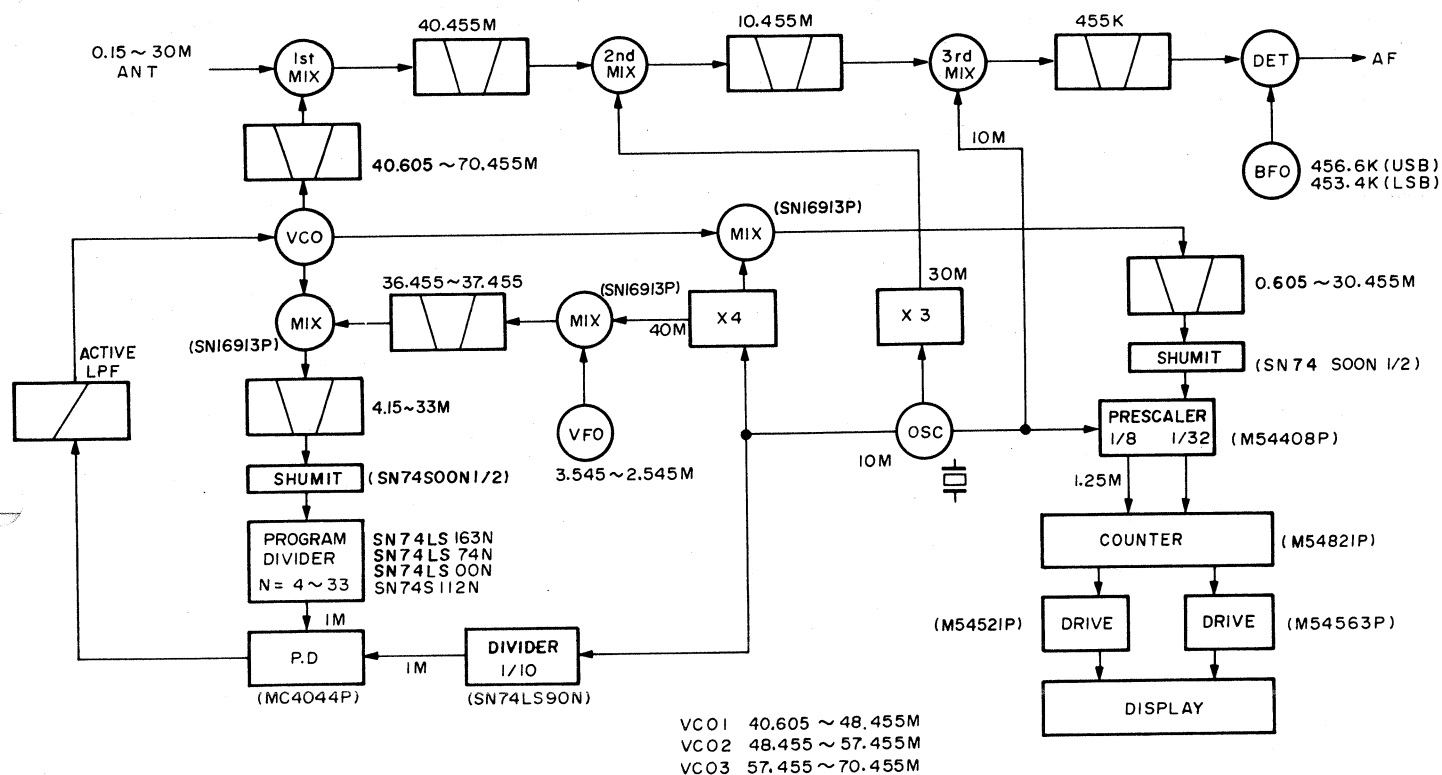


Fig. 7. Frequency Configuration

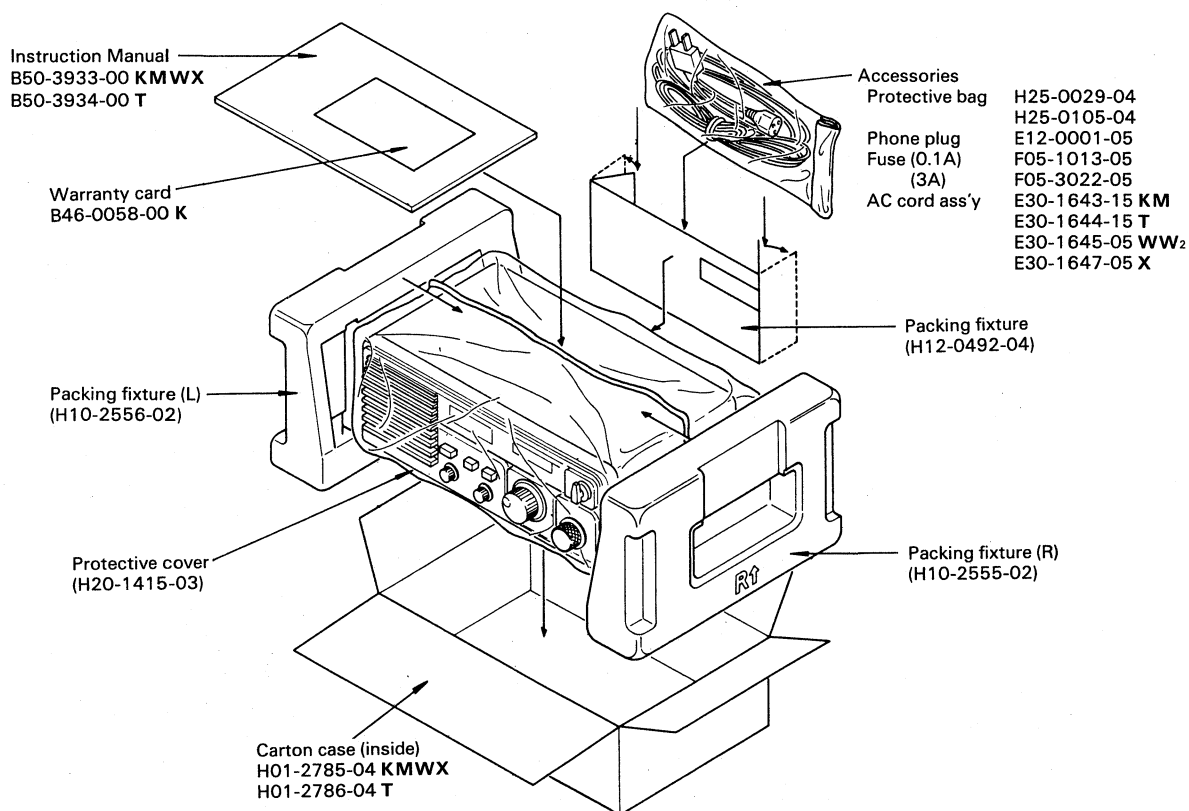


Fig. 8. Packing

PARTS LIST

CAPACITORS

CC 45 TH 1H 220 J
1 2 3 4 5 6

- 1 = Type ceramic, electrolytic, etc. 4 = Voltage rating
2 = Shape round, square, etc. 5 = Value
3 = Temp coefficient 6 = Tolerance

● Temperature coefficient

1st Word	C	L	P	R	S	T	U
Color※	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm/°C	0	-80	-150	-220	-330	-470	-750

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

Example: CC45TH = -470 ± 60ppm/°C

● Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40	+80	+100	More than 10μF -10 ~ +50 Less than 4.7μF -10 ~ +75
							-20	-20	-0	

Symbol	Destination
K	U.S.A.
W	Europe
T	Britain
X	Australia
M	General market

Resistors not listed in this parts list are standard, fixed carbon composition, 1/4W or 1/8W.
The resistance values, in ohms, are indicated on the schematic diagram.

● Rating voltage

2nd word 1st word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	—
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	—
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	—

● Capacitor value

0 1 0 = 1pF

1 0 0 = 10pF

1 0 1 = 100pF

1 0 2 = 1000pF = 0.001μF

1 0 3 = 0.01μF

2 2 0 = 22pF
1st number 2nd number Multiplier

Less than 10 pF

Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

Abbreviation	Cap	Capacitor	Abbreviation	ML	Mylar
C	Capacitor	Ceramic	S	Styren	
E	Electrolytic		T	Tantalum	
MC	Mica				

SEMICONDUCTOR

N: New parts

Name	Re- marks	Part No.	Q'ty
Diode			
1N60		V11-0051-05	9
1S1007		V11-4160-66	2
1S1555		V11-0076-05	4, 6(X)
1S1587		V11-0370-05	14
1S2588		V11-0414-05	7
V03C		V11-0290-05	5
Varistor			
MV13		V21-0004-05	1
Vari-cap			
1SV546GC		V11-4173-46	3
LED			
SL-2504K(Green)		V11-6178-36	1
FET			
2SK19(Y)		V09-0011-05	1
2SK19(GR)		V09-0012-05	4
3SK73(GR)		V09-1002-46	6
TR			
2SA1015(Y)		V01-1015-06	1
2SC1775(E)		V03-1775-06	3
2SC1815(Y)		V03-1815-06	24, 25(W2)
2SC1923(O)		V03-1923-06	9
2SC1959(Y)		V03-1959-06	4
2SC2240(GR)		V03-2240-06	3
2SC460(B)		V03-0079-05	2
IC			
HA1368R		V30-1129-06	1
M54408P		V30-1044-16	1
M54521P		V30-1044-26	1
M54563P		V30-1044-36	1
M54821P		V30-1044-46	1
MC4044P		V30-0173-05	1
NJM78M09A		V30-1107-16	1

Name	Re- marks	Part No.	Q'ty
SN16913P		V30-1048-06	3
SN74S00N		V30-0181-05	2
SN74S112N		V30-0185-05	1
SN74LS163N		V30-1114-06	1
SN74LS90N		V30-1005-26	1
SN74LS00N		V30-1005-66	1
SN74LS74N		V30-1005-86	1
UPC14305		V30-1029-26	1

GENERAL

Part No.	Re- marks	Description	Q'ty
A01-0917-12	N	Case (upper)	1
A01-0918-12	N	Case (lower)	1
A20-2442-03	N	Panel	1
A23-1464-03	N	Rear panel	1
B01-0645-05	N	Panel escutcheon	1
B03-0524-04	N	Handle, Rear plate	1
B05-0720-04	N	Speaker grill cloth	1
B10-0640-04	N	Front glass (B) LED	1
B10-0648-04	N	Front glass (A)	1
B30-0824-05	N	Pilot lamp	1
B31-0636-05	N	Meter	1
B43-0669-04	N	Badge TRIO	1
B43-0670-04	N	Badge KENWOOD	1
B46-0058-10	N	Warranty card	1
B50-3933-00	N	Instruction Manual	1
B50-3934-00	N	Instruction Manual	1
C02-0021-05	N	Polyethylene variable cap	1
C05-0010-15	N	Ceramic trimmer 10pF TC1	1
C90-0300-05	N	C, 470pF AC 150V C2	1

PARTS LIST

Part No.	Re- marks	Description	Q'ty
C91-0079-05		C, 0.01 μ F AC 125V C ₁ W ₂	1
C91-0456-05		C, 0.47 μ F 25V C ₆ W ₂	1
CC45CG1H220J		C, 22pF C ₅ W ₂	1
CK45B1H102K		C, 0.001 μ F C ₃ , C ₄ W ₂	2
D40-0620-05		Dial Ass'y	1
E04-0152-05		M-Type receptacle ANT	1
E11-0402-15		US jack REC.	1
E12-0001-05		Phone plug	1
E18-0351-05		3P Inlet AC Power	1
E29-0407-05		Bridge connector W ₂	1
E30-1643-15		AC Cord Ass'y K,M	1
E30-1644-15		AC Cord Ass'y T	1
E30-1645-05		AC Cord Ass'y W,W ₂	1
E30-1647-05		AC Cord Ass'y X	1
F05-1013-05		Fuse 0.1A (RX)	1
F05-3022-05		Fuse 3A (PLL)	1
F15-0627-04		Shadow mask LED	1
F19-0610-04		Connector mask (A) DC 13.8V	1
G53-0510-04		Packing, Case (upper, lower)	2
H01-2785-04	N	Carton case (inside) K,M,W,W ₂ ,X	1
H01-2786-04	N	Carton case (inside) T	1
H03-2026-04	N	Carton case (outside)	1
H10-2555-02	N	Packing fixture (R)	1
H10-2556-02	N	Packing fixture (L)	1
H12-0492-04		Packing fixture	1
H20-1415-03		Protective cover	1
H25-0029-04		Protective cover 60 x 100	1
H25-0105-04		Protective bag 150 x 350	1
J02-0049-14		Foot Rear	2
J02-0403-04		Rubber foot Side	4
J02-0423-04	N	Foot Front	2
J02-0424-04	N	Foot ass'y Front	2
J25-3120-14	N	Frequency shift unit W ₂	1
K01-0407-05	N	Handle	1
K21-0760-04	N	Knob, BAND K,M,T,W,X	1
K21-0762-04	N	Knob, BAND W ₂	1
K23-0711-04		Knob, MODE	1
K23-0752-04	N	Knob, AF, TONE	2
K29-0756-04	N	Main knob	1
K29-0757-04	N	Push knob Power	1
K29-0758-04	N	Push knob NB, ATT	2
K29-0759-04	N	Ring, Main knob	1
L01-8054-05	N	Power transformer	1
N09-0256-05		Screw, Earth	4
N10-2026-46		Nut DC 13.8V	2
N10-2030-46		Nut AC	2
N10-2080-46	N	Nut REC	1
N30-2608-41		Pan head screw DC 13.8V	2
N30-3006-46		Pan head screw VFO, Master	5
N30-3008-41		Pan head screw AC IN	2
N30-3012-41		Pan head screw 3 x 12 Voltage	2
N32-2606-46		Flat screw Panel	4
N32-3006-46		Flat screw SP	4
N33-3006-41		Round flat head screw	2
N35-3006-41		Bind screw Case	16
N87-3006-41		Tap tight screw 3 x 6	9

Part No.	Re- marks	Description	Q'ty
N87-3008-41		Tap tight screw ANT	2
N87-3012-46		Tap tight screw PCB Panel	20
N87-3014-46		Tap tight screw Panel	2
N87-4008-46		Tap tight screw Trans	2
N87-4010-46		Tap tight screw Foot	4
N88-2606-46		Flat head tap tight screw Frontglass, Escutcheon	8
N88-3006-46		Flat head tap tight screw Subpanel, LED	8
S29-1413-05		Voltage select switch	1
T07-0218-05	N	Speaker	1
X50-1850-00	M	PLL unit K,M,T,W,X	1
X50-1850-61	N	PLL unit W ₂	1
X55-1310-00	N	RX unit K,M,T,W	1
X55-1310-61	N	RX unit W ₂	1
X55-1310-71	N	RX unit X	1

PLL UNIT (X50-1850-XX) 00 : K,M,T,W,X 61 : W₂

Part No.	Re- marks	Description	Ref. No.	Q'ty
C05-0010-15		Ceramic trimmer, 10pF	TC2	1
C05-0029-15		Ceramic trimmer, 50pF	TC1	1
C90-0814-05		E, 4700 μ F, 25V	C145	1
C91-0451-05		C, 0.01 μ F x 6	CA1	1
C91-0456-05		C, 0.047 μ F, 25V	C6,13,21,40, 51,76,82,88, 95,98,99,101, 112,122,128, 129,132,152, 167,177,178, 182,183,184	24
C91-0457-05		C, 0.022 μ F, 25V	C173	1
CC45CG1H150J		C, 15pF	C114	1
CC45CG1H330J		C, 33pF	C106	1
CC45CG1H820J		C, 82pF	C107	1
CC45LG1H121J		C, 120pF	C105,110	2
CC45LG1H221J		C, 220pF	C103,104,109, 111	4
CC45LG1H820J		C, 82pF	C108	1
CC45CH1H010C		C, 1pF, ± 0.25 pF	C59,155	2
CC45CH1H030C		C, 3pF, ± 0.25 pF	C34	1
CC45CH1H050C		C, 5pF	C4,11,77,81, 113	5
CC45CH1H0R5C		C, 0.5pF, ± 0.25 pF	C55,68,79,169, 170	5
CC45CH1H330J		C, 33pF	C5,12	2
CC45RH1H070D		C, 7pF, ± 0.5 pF	C90,92	2
CC45RH1H100D		C, 10pF, ± 0.5 pF	C124,126	2
CC45RH1H220J		C, 22pF	C31,91	2
CC45RH1H270J		C, 27pF	C30	1
CC45SL1H050C		C, 5pF, ± 0.25 pF	C123,159,166, 181	4
CC45SL1H070D		C, 7pF, ± 0.5 pF	C52,156,163	3
CC45SL1H100D		C, 10pF, ± 0.5 pF	C37,46,65,72, 160	5

PARTS LIST

Part No.	Re- marks	Description	Ref. No.	Q'ty
CC45SL1H101J		C, 100pF	C50,85,161, 174	4
CC45SL1H150J		C, 15pF	C24,60	2
CC45SL1H180J		C, 18pF	C28	1
CC45SL1H151J		C, 150pF	C94	1
CC45SL1H330J		C, 33pF	C42,125,137	3
CC45SL1H331J		C, 330pF	C44	1
CC45SL1H470J		C, 47pF	C43	1
CC45UJ1H050C		C, 5pF, ± 0.25 pF	C3, 10, 18	3
CC45UJ1H330J		C, 33pF	C20	1
CC45UJ1H470J		C, 47pF	C2, 9, 17	3
CE04W1A101M		E, 100 μ F, 10V	C41,140	2
CE04W1A470M		E, 47 μ F, 10V	C7,14,22,49, 179	5
CE04W1E100M		E, 10 μ F, 25V	C130	1
CE04W1E101M		E, 100 μ F, 25V	C141	1
CE04W1E470M		E, 47 μ F, 25V	C147	1
CK45B1H102K		C, 0.001 μ F	C29, 33, 83, 89	4
CK45B1H222K		C, 0.0022 μ F	C1	1
CK45F1H103Z		C, 0.01 μ F	C8,16,23,26, 36,45,53,57, 58,63,64,66, 70,71,73,74, 75,84,86,87, 93,96,100,116, 119,120,121, 154,158,162, 164,157,175, 197	34
CK45F1H223Z		C, 0.022 μ F	C127,131	2
CK45F1H473Z		C, 0.047 μ F	C47,48,102, 133,134,135, 136,138,139, 142,143,144, 146,172	14
CQ92M1H102K		ML, 0.001 μ F	C38	1
CQ92M1H104K		ML, 0.1 μ F	C39,148,149	3
E18-0252-05	N	Pin connector		1
E40-0273-05		Mini connect wafer 2P		6
E40-1173-05		Mini connect wafer 11P		1
E40-1373-05		Mini connect wafer 13P		1
F05-3022-05		Fuse 3.0A		1
G53-0511-04		Packing		
J13-0401-05		Fuse holder		2
J31-0502-04		P CB collar		8
J42-0428-05		P CB bush		8
L32-0645-05	N	OSC coil	T13	1
L34-0852-05		Tuning coil, VC02	T2	1
L34-0854-05		Tuning coil, VC03	T3	1
L34-2058-05	N	Tuning coil, VC01	T1	1
L34-2061-15	N	Tuning coil	T6,16	2
L34-2062-15	N	Tuning coil	T4,5	2
L34-2063-15	N	Tuning coil	T7,8	2
L34-2064-15	N	Tuning coil	T9,10,17	3
L34-2065-05	N	Tuning coil	T11,12	2
L34-2066-05	N	Tuning coil	T14,15	2

Part No.	Re- marks	Description	Ref. No.	Q'ty
L40-1011-03		Ferri-inductor, 100 μ H	L8,13,21,31, 29,33,34,38	8
L40-1011-12		Ferri-inductor, 100 μ H	L39	1
L40-1011-14		Ferri-inductor	L41	1
L40-1021-03		Ferri-inductor, 1mH	L22,23,28	3
L40-2282-01		Ferri-inductor, 0.22 μ H	L5,7	2
L40-3382-01		Ferri-inductor, 0.33 μ H	L6	1
L40-4701-03		Ferri-inductor, 47 μ H	L8,18,30	3
L40-4701-13		Ferri-inductor	L40	1
L40-4711-03		Ferri-inductor, 470 μ H	L9,10,11,12, 14,15,16,17, 19,20,24,25, 26,27,35,36, 37	17
L40-4782-02		Ferri-inductor, 0.33 μ H	L4	1
L40-4791-02		Ferri-inductor, 4.7 μ H	L1,2,3	3
L77-0482-05		Crystal, 10MHz	X1	1
N09-0641-05	N	Round small screw		1
N30-3006-46		Pan-head screw		1
RD14BY2H221J		RD, 1/2W		8
RS14AB3D150J		MF 15 Ω , $\pm 5\%$	R97	1
R90-0510-05		Compound resistor,	RA1	1
R92-0150-05		Short jumper	472k \times 8	63
S29-1423-05	N	Band switch K,M,T,W,X		1
S29-1424-05	N	Band switch W ₂		1
S40-2427-05	N	Push switch, Power	S4	1
S40-2428-05	N	Push switch, RFATT, NB	S2,3	2

RX UNIT (X55-1310-XX) 00 : K,M,T,W 61 : W₂ 71 : X

Part No.	Re- marks	Description	Ref. No.	Q'ty
C90-0843-05		E, 0.33 μ F, 50V	C183	1
C91-0455-05		C, 0.01 μ F, 25V	C106,171,180	3
C91-0456-05		C, 0.047 μ F, 25V	C83,87,97,103, 163,187	6
C91-0490-05	N	C, CG1000pF, 50V	C136	1
CC45CG1H270J		C, 27pF	C134	1
CC45CH1H070D		C, 7pF, ± 0.5 pF	C73,75	2
CC45CH1H1R5C		C, 1.5pF, ± 0.25 pF	C74	1
CC45CH1H050C		C, 5pF, ± 0.25 pF	C149	1
CC45CH1H330J		C, 33pF	C141	1
CC45CH1H820J		C, 82pF	C142	1
CC45RH1H070D		C, 7pF	C71,76	2
CC45RH1H221J		C, 220pF	C135	1
CC45SL1H050C		C, 5pF, ± 0.25 pF	C52,53,61,67	4
CC45SL1H100D		C, 10pF, ± 0.5 pF	C59	1
CC45SL1H101J		C, 100pF	C108	1
CC45SL1H120J		C, 12pF	C126,127	2
CC45SL1H121J		C, 120pF	C15,17,24	3
CC45SL1H150J		C, 15pF	C49,68	2
CC45SL1H151J		C, 150pF	C20	1
CC45SL1H181J		C, 180pF	C6,8	2
CC45SL1H220J		C, 22pF	C44,47	2
CC45SL1H221J		C, 220pF	C16	1
CC45SL1H270J		C, 27pF	C48,86	2

PARTS LIST

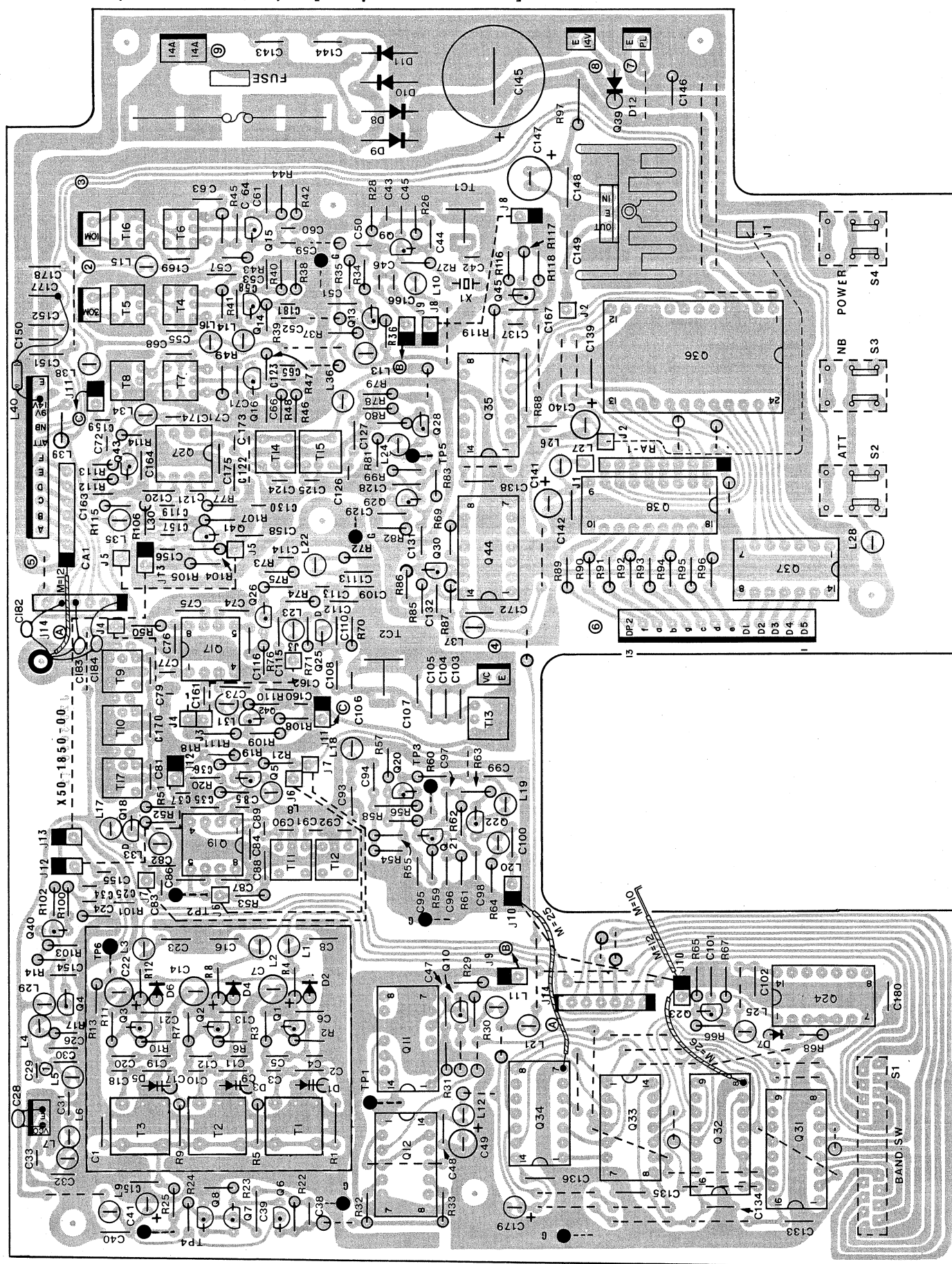
Part No.	Re- marks	Description	Ref. No.	Q'ty	Part No.	Re- marks	Description	Ref. No.	Q'ty
CC45SL1H330J		C, 33pF	C31,33,36,39, 41	5	E23-0046-04		Square terminal		1
CC45SL1H390J		C, 39pF	C102	1	E23-0420-05		Earth lug 3.2ø		1
CC45SL1H391J		C, 390pF	C7	1	E40-0273-05		Mini connect wafer, 2P		8
CC45SL1H470J		C, 47pF	C40	1	E40-0673-05		Mini connect wafer 6P		1
CC45SL1H560J		C, 56pF	C28,32	2	F05-1013-05		Fuse, 0.1A		1
CC45SL1H680J		C, 68pF	C23,25	2	J13-0039-05		Fuse holder		2
CE04W1A101M		E, 100μF, 10V	C98,111,118, 119,125,182	6	J31-0502-04		PCB collar		8
CE04W1A470M		E, 47μF, 10V	C124,128	2	J42-0428-05		PCB bush		8
CE04W1C100M		E, 10μF, 16V	C88,89,116, 169,181	5	L19-0324-05		Wide bandwidth trans	T3	1
CE04W1C101M		E, 100μF, 16V	C152,166	2	L19-0332-05	N	Input trans	T1	1
CE04W1C102M		E, 0.001μF, 16V	C131	1	L32-0195-05		Tuning coil, 40.455MHz	T2	1
CE04W1C221M		E, 220μF, 16V	C167	1	L32-0646-05	N	OSC coil, 455KHz BFO	T19	1
CE04W1C471M		E, 470μF	C130	1	L34-0540-05		Tuning coil, 455KHz	T13,17	2
CE04W1H0R1M		E, 0.1μF, 50V	C115	1	L34-0858-05		Tuning coil, 40.455MHz	T4,7	2
CE04W1H010M		E, 1μ, 50V	C4,10,13,19, 21,27,29,35, 37,43,45,51, 112,140,143, 147,151,156, 175,177	20	L34-0863-05		Tuning coil, 455KHz	T18	1
CE04W1HR47M		E, 0.47μF, 50V	C90,91,92,93, 110,117,120, 122,133,145, 153,157	12	L34-0864-05		Tuning coil, 455KHz	T10	1
CK45B1H102K		C, 0.001μF	C66,77,81,84, 144,159,160	7	L34-0865-15		Tuning coil, 455KHz	T11	1
CK45B1H331K		C, 330pF	C173,174	2	L34-0866-15		Tuning coil, 455KHz	T12	1
CK45B1H471K		C, 470pF	C11,12	2	L34-0868-05		Tuning coil, 455KHz	T14	1
CK45F1H103Z		C, 0.01μF	C1,54,60,63, 78,79,80,82, 85,94,99,107, 109,132,146, 148,161,176, 178,179,184, 185,186	24	L34-0870-05		Filter coil, 2.7μH	L24,25,26	3
CK45F1H473Z		C, 0.047μF	C5,9,14,18, 22,26,30,34, 38,42,46,50, 55,56,57,58, 62,64,65,69, 70,72,95,96, 100,101,104, 105,150,154, 155,158,162, 164,165,168, 170	37	L34-0878-05		Filter coil, 33μF	L41	1
CQ92M1H102K		ML, 0.001μF	C114,139	2	L34-2068-05	N	Tuning coil, 40.455MHz	T5,6	2
CQ92M1H162K		ML, 0.0016μF	C139	1	L34-2069-05	N	Tuning coil, 10.455MHz	T8	1
CQ92M1H104K		ML, 0.1μF	C129,172	2	L34-2070-05	N	Tuning coil, 10.455MHz	T9	1
CQ92M1H123K		ML, 0.012μF	C113	1	L34-2071-05	N	Tuning coil, 30MHz	T15	1
CQ92M1H332K		ML, 0.0033μF	C2,3	2	L34-2072-05	N	Tuning coil, 10MHz	T16	1
CQ92M1H333K		ML, 0.033μF	C138	1	L34-3052-05	N	Filter coil, 1.5μH	L23	1
CQ92M1H393K		ML, 0.039μF	C114	1	L34-3053-05	N	Filter coil, 1.2μH	L22	1
CQ92M1H473K		ML, 0.047μF	C123	1	L40-1011-03		Ferri-inductor, 100μH	L5,6	2
CQ09S1H561J		S, 560pF	C137	1	L40-1021-03		Ferri-inductor, 1mH	L9,27,28,30, 31,32,33,34	8
E11-0408-05		US jack, EXT.SP		1	L40-1501-03		Ferri-inductor, 15μH	L16,17	2
E11-0413-05	N	US jack, phones		1	L40-1511-03		Ferri-inductor, 150μH	L3,4,42,43	4
E21-0459-05	N	4P terminal, ANT		1	L40-2201-03		Ferri-inductor, 22μH	L14,15	2
					L40-3301-03		Ferri-inductor, 33μH	L12,13	2
					L40-3382-01		Ferri-inductor, 0.33μH	L29	1
					L40-3991-02		Ferri-inductor, 3.9μH	L21	1
					L40-4701-03		Ferri-inductor, 47μH	L10,11,39,40	4
					L40-4791-02		Ferri-inductor, 4.7μH	L18,19,20	3
					L40-6801-03		Ferri-inductor, 68μH	L7,8	2
					L40-6811-03		Ferri-inductor, 680μH	L1,2	2
					L40-6891-13		Ferri-inductor, 6.8μH W ₂	L35~38	4
					L72-0319-05		Ceramic filter, AM.W	F2	1
					L72-0331-05	N	SFE10-455MJ	F1	1
					L72-0332-05	N	SSB.AM-N	F3	1
					N09-0641-05	N	Round small screw		2
					N10-2030-46		Nut		2
					N30-3006-46		Pan-head screw		1
					N30-3010-46		Pan-head screw		2
					R01-3421-05	N	Pot, 10K(A) AF.TONE	VR6,7	2
					R12-1038-05		Trim.Pot. 1K	VR1	1
					R12-1039-05		Trim.Pot. 2.2K	VR2	1
					R12-3045-05		Trim.Pot. 10K	VR4	1
					R12-5030-05		Trim.Pot. 100K	VR3	1
					R12-6401-05		Trim.Pot. 470K	VR5	1
					R92-0150-05		Short jumper		40
					R92-0150-05		Short jumper, W ₂		36
					S29-1425-05		Rotary switch MODE	S1	1
					S51-1404-05		Relay, G2E1 2V	RL1	1

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PC BOARD VIEW

PLL UNIT (X50-1850-00, 61)

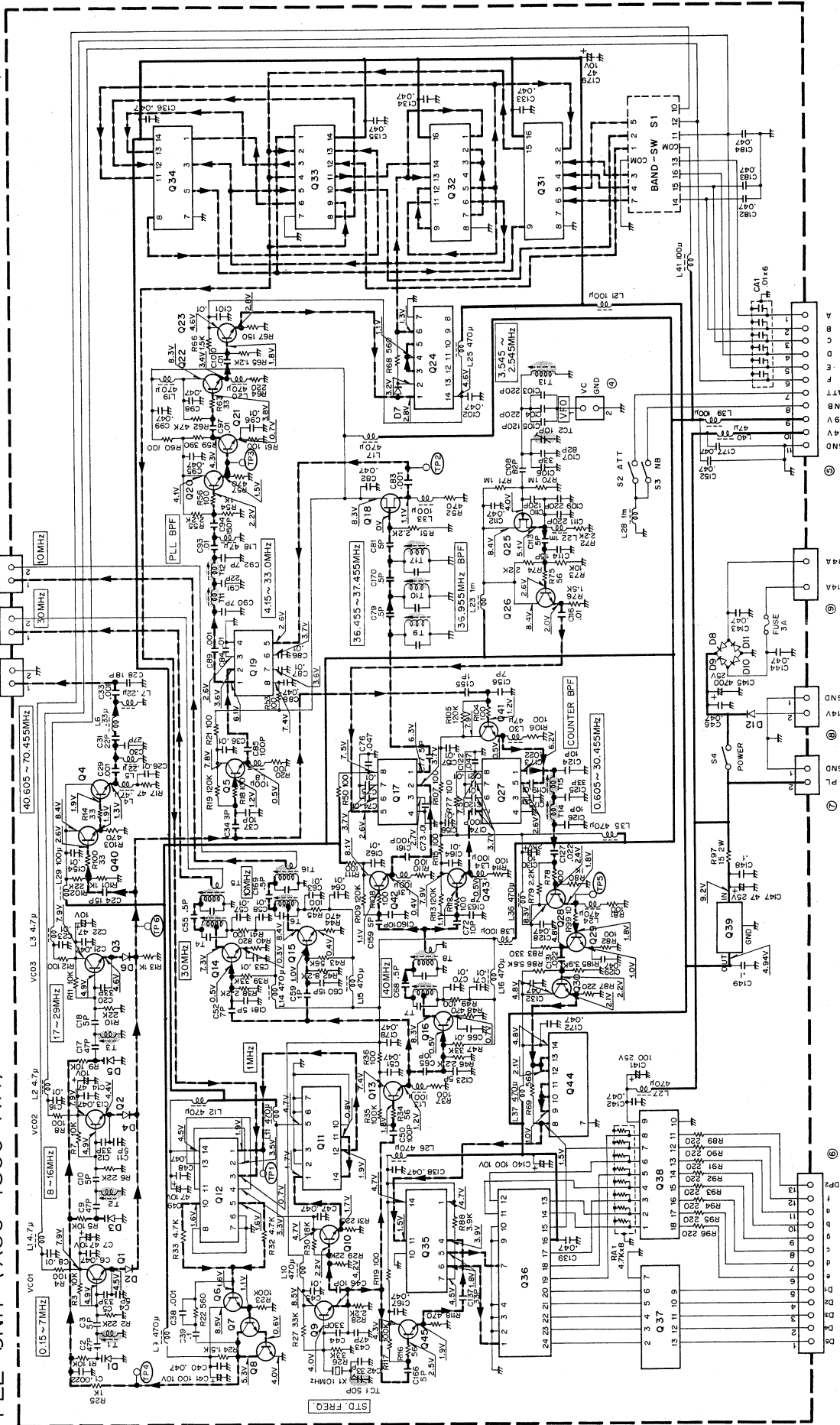
[Component Side View]



CIRCUIT DIAGRAM

PLL UNIT (X50-1850-00, 61)

PLL UNIT (X50-1850-XX)



- Q1~3, 5, 20, 21, 29 : MC4044P Q25 : 2SK19(Y) Q35 : M5440BP Q42, 43 : 2SC460(B) D1, 3, 5 : ISV54GC
 40, 41 : 2SC1923(O) Q17, 19, 27 : SN16913P Q36 : M54821P Q42, 43, 6, 7 : IS1587
 06, 7, 8 : 2SC1775(E) Q18 : 2SK19(IGR) Q37 : M54521P D8~12 : V03C
 09, 10, 13~16, 22 : 2SC1955(Y) Q4, 23 : SN74LS00N Q38 : M54563P Q39 : JPC14305
 26, 28, 30, 45 : SN74LS00N Q24, 44 : SN74LS00N Q39 : JPC14305
 Q11 : SN74LS90N

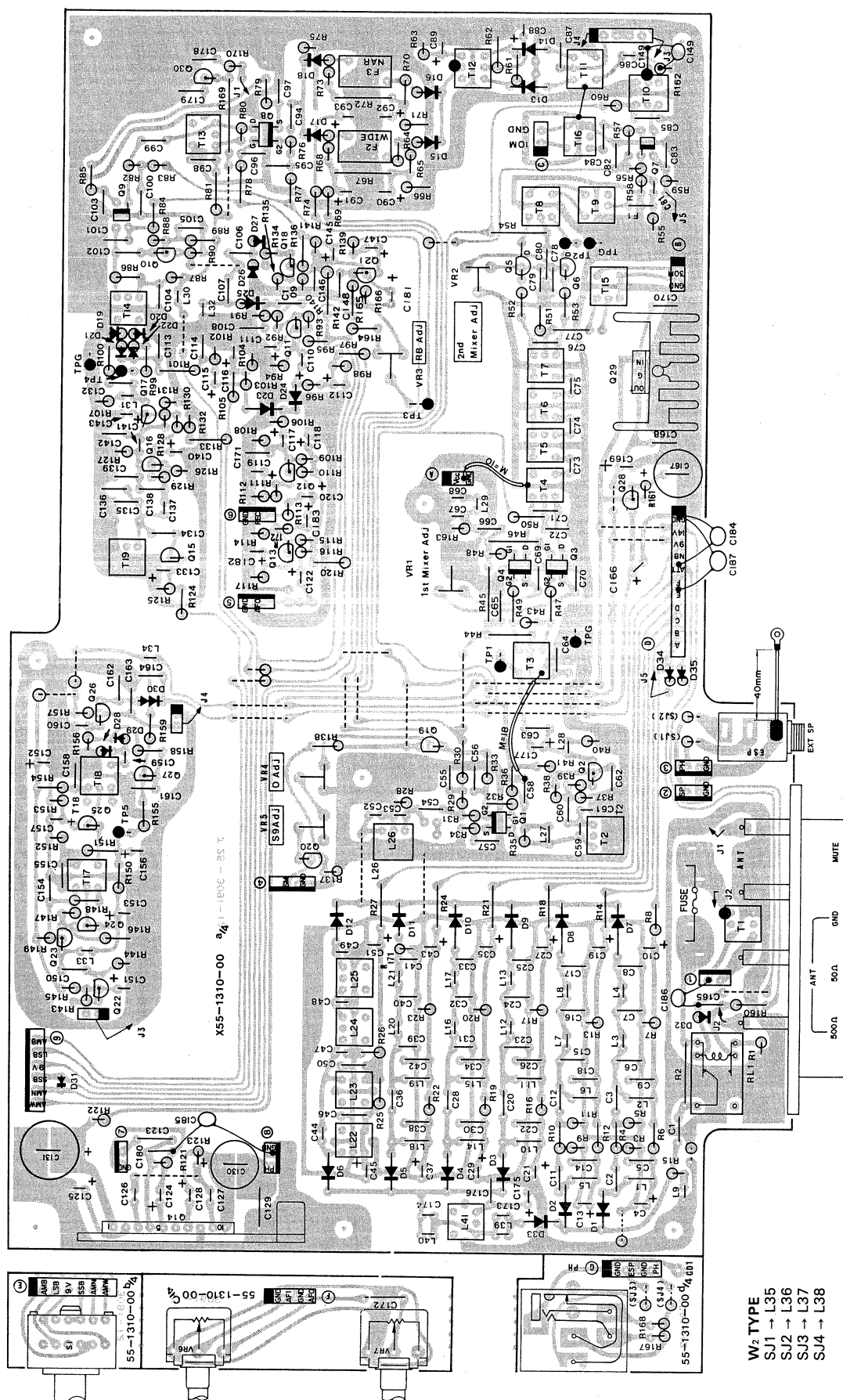
Signal line — Control line — Common DC line

R-600

PC BOARD VIEW

RX UNIT (X55-1310-00, 61, 71)

[Component Side View]



- W2 TYPE
 SJ1 → L35
 SJ2 → L36
 SJ3 → L37
 SJ4 → L38

- 01, 3, 4, 7, 8, 9 : 3SK73 (GR)
 02, 10, 15 ~ 18 : 2SC1815 (Y)
 21 ~ 27 : (S1587)
 05, 6, 19 : 2SK19 (GR)
 011, 12, 13 : 2SC2240 (GR)
 014 : HA1368R
 020 : 2SA1015
 028, 30 : 2SC1959 (Y)
 029 : NJM78M09A

- MV-13
 GREEN
 500Ω 50A GND MUTE

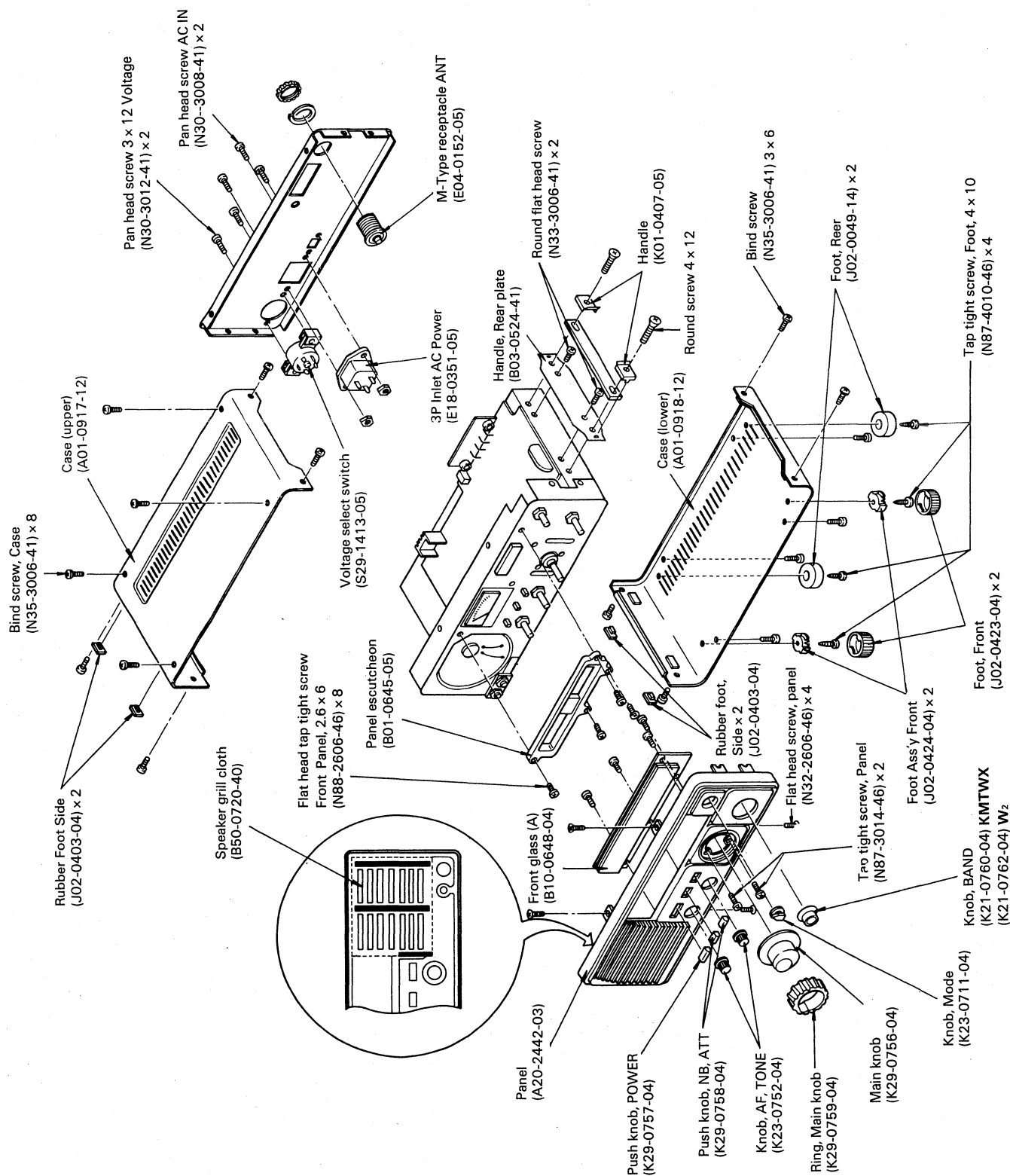
- 2SK19(Y)
 2SK19(GR)

- 3SK73
 G2 G1

- 2SA1015(Y) 2SC1959(Y)
 2SC1775(E) 2SC2240(GR)
 2SC1815(Y) 2SC1923(O)

- 2SC460(B)
 OR
 EC

DISASSEMBLY

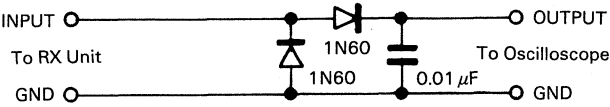


ADJUSTMENT

REQUIRED TEST EQUIPMENT

1. VTVM or DVM
- 1) Input resistance: More than 1 MΩ
- 2) Voltage range: 1.5 to 1000 V AC/DC
- NOTE: A high-precision voltmeter may be used.
- However, accurate readings can not be obtained for high-impedance circuits.
2. RF VTVM
- 1) Input impedance: 1 MΩ and less than 3 pF.
- 2) Voltage range: 10 mV to 300V
- 3) Frequency range: 50 MHz or greater
3. AF VTVM
- 1) Frequency range: 50 Hz to 10 kHz
- 2) Input impedance: 1 MΩ or greater
- 3) Voltage range: 10 mV to 30V
4. AF DUMMY LOAD
- 1) Impedance: 8Ω
- 2) Dissipation: 3W or greater
5. OSCILLOSCOPE
- Requires high sensitivity and external synchronization capability.
6. SWEEP GENERATOR
- 1) Center frequency: 8 to 40 MHz
- 2) Sweep bandwidth: Maximum ± 16 MHz
- 3) Output voltage: More than 0.1V
7. STANDARD SIGNAL GENERATOR (SSG)
- 1) Frequency range: 100 kHz to 80 MHz
- 2) Output: -20 dB/0.1 μV to 120 dB/1V
- 3) Output Z = 50 Ω
- 4) Should have AM modulation capability.
- Generator must be frequency stable.
8. FREQUENCY COUNTER
- 1) Minimum input voltage: 50 mV
- 2) Frequency range: Greater than 80 MHz

9. NOISE GENERATOR
- Must generate ignition-like nose containing harmonics beyond 30 MHz.
10. DETECTOR
- 1) For adjustment of RX unit.



- PREPARATION
- Unless otherwise specified, set the controls as follows.
- Power ON
- NB OFF
- BAND 14
- RF ATT OFF
- AF MIN.
- MODE AM WIDE

REFERENCE	
Japanese "SSG"	American "SG"
-6 dB	0.25 μV
0 dB	0.5 μV
6 dB	1 μV
12 dB	2 μV
24 dB	8 μV
30 dB	15.8 μV
40 dB	50 μV
50 dB	158 μV
60 dB	500 μV
70 dB	1.58 mV
80 dB	5 mV
90 dB	15.8 mV
100 dB	50 mV
120 dB	0.5 V

< PLL section adjustments >

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Ter-minal	Unit	Parts	Method		
1. VFO tracking	1) Turn the VFO knob fully clockwise.	f counter	PLL	Q17 pin 5	PLL	T13	2.479 MHz	± 500 Hz	Repeat the adjustment several times until the frequency is within specification.
	2) Turn the VFO knob fully counterclockwise.					TC2	3.599 MHz	± 500 Hz	
	3) VFO: 500	RF VTVM						120 ± 30 mV	Check
2. 10 MHz reference XTAL frequency adjustment		f counter	PLL	TP1	PLL	TC1	1.0 MHz	± 10 Hz	
3. 40 MHz 4X multiplies		RF VTVM	PLL	Q27 pin 2	PLL	T7, T8	Max.	(Reference value: 0.22V)	
4. 30 MHz 3X multiplies		RF VTVM	PLL	(2) connector 1, 2 (GND)	PLL	T4, T5	Max.	(Reference value: 72 mV)	

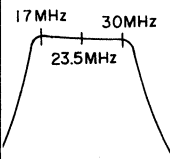
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
5. 10 MHz output		RF VTVM	PLL	(3) connector 1, 2 (GND)	PLL	T6, T16	Max.	(Reference value: 58 mV)	
6. 36.955 MHz BPF	1) VFO-600	RF VTVM	PLL	TP2	PLL	T9, T10, T17	Max.	(Reference value: 92 mV)	
	2) VFO: 0 or 1.000						Adjust the VFO from 0 to 1.000, and note the output level difference from the VFO setting at 600.	Within $+0$ -1.5 dB	Check
7. PLL BPF	1) VFO: 0 SSG output: 70 MHz 127 dB (+10 dBm)	SSG RF VTVM	PLL	TP6, TP3	PLL	T12	Max.	(Reference value: 70 mV)	Connect the SSG output to TP6 via 0.01 μ F 50WV capacitor.
	2) VFO: 0 SSG output: 77 MHz 127 dB (+10 dBm)					T11	Min.	(Reference value: 25 mV)	
8. Counter BPF	1) VFO: 0 SSG output: 71.5 MHz 117 dB (+10 dBm)	SSG RF VTVM	PLL	TP6, TP3	PLL	T15	Max.	Reference value: 200 mV)	Connect the SSG output to TP6 via 0.01 μ F 50WV capacitor.
	2) VFO: 0 SSG output: 74.5 MHz 117 dB (+10 dBm)					T14	Min.	(Reference value: 50 mV)	
9. VCO 1	1) BAND: 3 VFO: 4,000	DVM	PLL	TP4	PLL	T1	3.8V	± 0.05 V	
	2)	f counter		(1) connector 1, 2 (GND)				44.455 MHz	Check
10. VCO 2	1) BAND: 11 VFO: 12,000	DVM	PLL	TP4	PLL	T2	3.8V	± 0.05 V	
	2)	f counter		(1) connector 1, 2 (GND)				52.455 MHz	Check
11. VCO 3 NOTE: For W2 models, include adjustment steps (3) and (4).	1) BAND: 29 VFO: 30,000	DVM	PLL	TP4	PLL	T3	7.6V	± 0.05 V	
	2)	f counter		(1) connector 1, 2 (GND)				70.455 MHz	Check
	3) BAND: 25 VFO: 26,000	DVM		TP4	PLL	T3	5.5V	± 0.05 V	
	4)	f counter		(3) connector 1, 2 (GND)				66.455 MHz	Check

< RX section adjustments >

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. RB voltage		DVM	RX	TP3	RX	VR3	2.1V	± 0.05 V	
2. BFO	1) MODE: USB	f counter	RX	TP4	RX	T19	456.7 kHz	± 20 Hz	
3. RF, IF amp	1) MODE: USB BAND: 14 VFO: 500 RF ATT: OFF	SSG AF VTVM, Oscilloscope, Dummy load	RX	ANT connector EXT SP	RX	T4 ~ T10, T15, T16, T11 ~ T14, T7 ~ T4	Adjust for max. output in the order listed. As the sensitivity increases, decrease the SSG output.	Should be greater than 0.8V/8 Ω when the SSG output is 0 dB (open) and AF GAIN is maximum.	

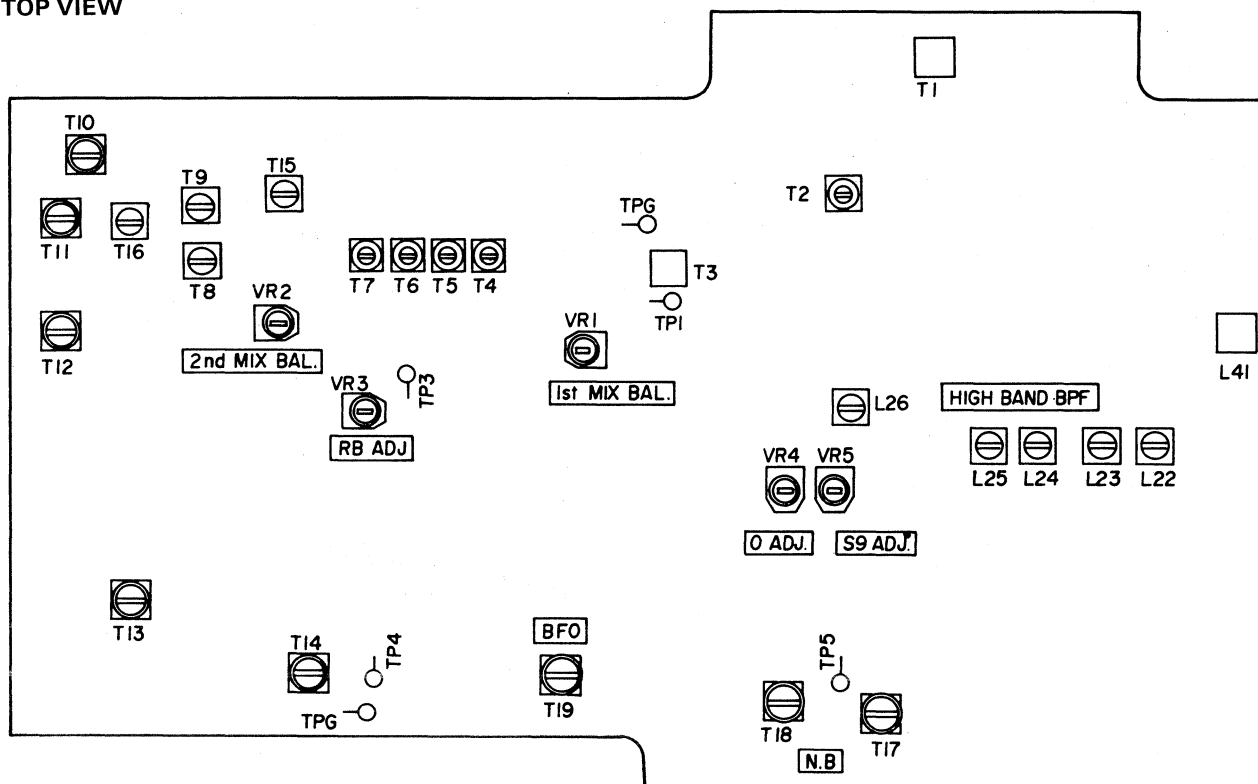
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
4. IF trap	1) MODE: USB BAND: 29 VFO: 500 RF ATT: OFF SSG output: 40,455 MHz 75 dB (open)	SSG AF VTVM, Oscilloscope, AF dummy load		ANT connector EXT SP	RX	T2	Min. when core is turned fully clockwise.		
5. High-band BPF NOTE: Perform this adjustment after the IF trap is adjustment is completed.	1) BAND: 17 ~ 29 RF ATT: OFF	Sweep GEN. Detector (oscilloscope)	RX	ANT connector TP1	RX	T22 ~ 26	Adjust T22 ~ 26 until the response shown at the right is obtained.		
6. NB	1) MODE: USB BAND: 14 VFO: 500 RF ATT: OFF SSG output: 14.5 MHz	SSG DVM	RX	ANT connector TP5	RX	T17, T18	Min. (First, adjust at 20 dB SSG output, then readjust at SSG minimum output.)		
	2) Connect the noise generator output to the ANT terminal	Noise GEN. SP				T12	With min. input, turn the core counter-clockwise until noise disappears.		Should be effective at both max. and min. noise input.
7. S meter	1) MODE: USB BAND: 14 VFO: 500 RF ATT: OFF	S meter			RX	VR4	At the point where the needle just begins to move (zero-set, no signal input).		
	2) SSG output (open): 14.5 MHz 8 dB	SSG		ANT connector		T13	S1	8 dB \pm 2 dB	
	3) SSG output (open): 14.5 MHz 30 dB					VR5	S9	30 dB \pm 10 dB	
8. 1st mixer balance	1) MODE: USB BAND: 0 VFO: 159 RF ATT: OFF				RX	VR1	Min. tone at 159 kHz		
9. 2nd mixer balance	1) MODE: USB BAND: 14 VFO: 500 RF ATT: OFF SSG output (open): 14.5 MHz 8 dB	SSG AF VTVM, Oscilloscope		ANT connector EXT SP		VR2	Max.		If a maximum setting cannot be obtained, set to the mechanical center.
10. BFO (minute adjustment)	1) MODE: USB and LSB AF GAIN: the point where the noise can be adjusted.	SP			RX	T19	The noise should be the same tone between USB and LSB.		
11. Sensitivity difference USB and LSB.	1) MODE: USB and LSB BAND: 14 VFO: 500 SSG output: 14.5 MHz 0 dB (open)	SSG AF VTVM Oscilloscope		ANT connector EXT SP	RX	T11 T12	AF output (f = 1 kHz) should be the same level between USB and LSB.	Within 1.5 dB	After this adjustment check the BFO is correct.

ADJUSTMENT

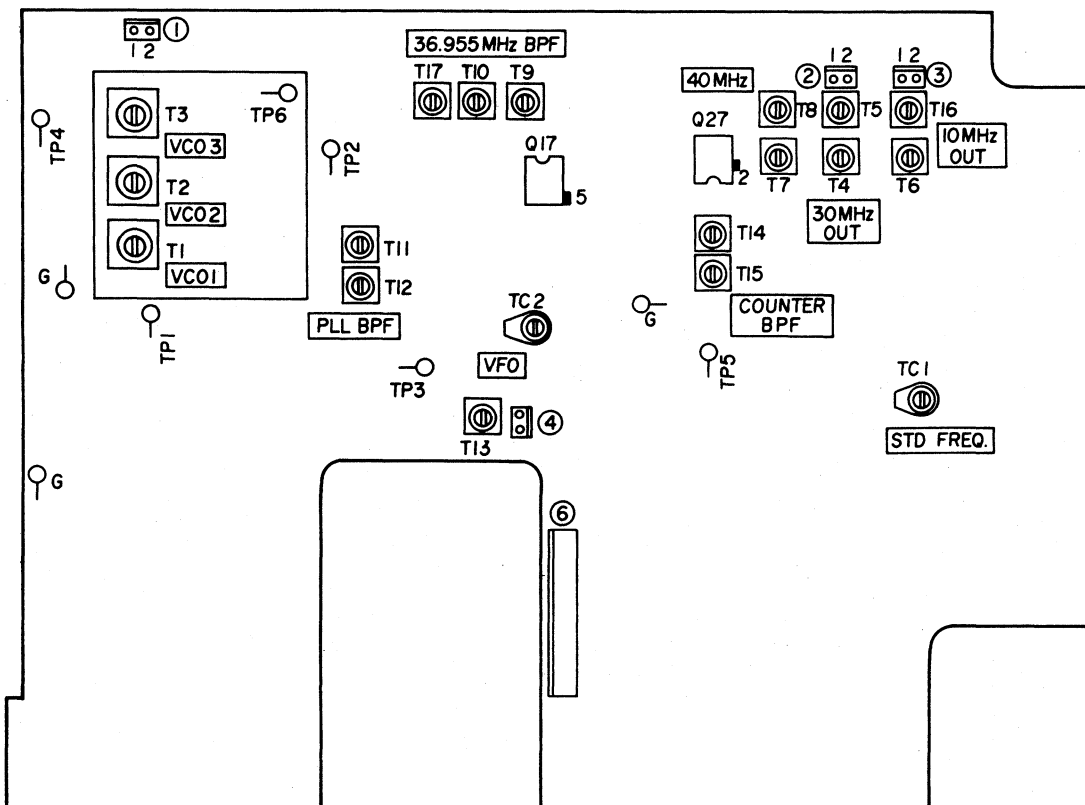
RX UNIT (X55-1310-XX)

TOP VIEW

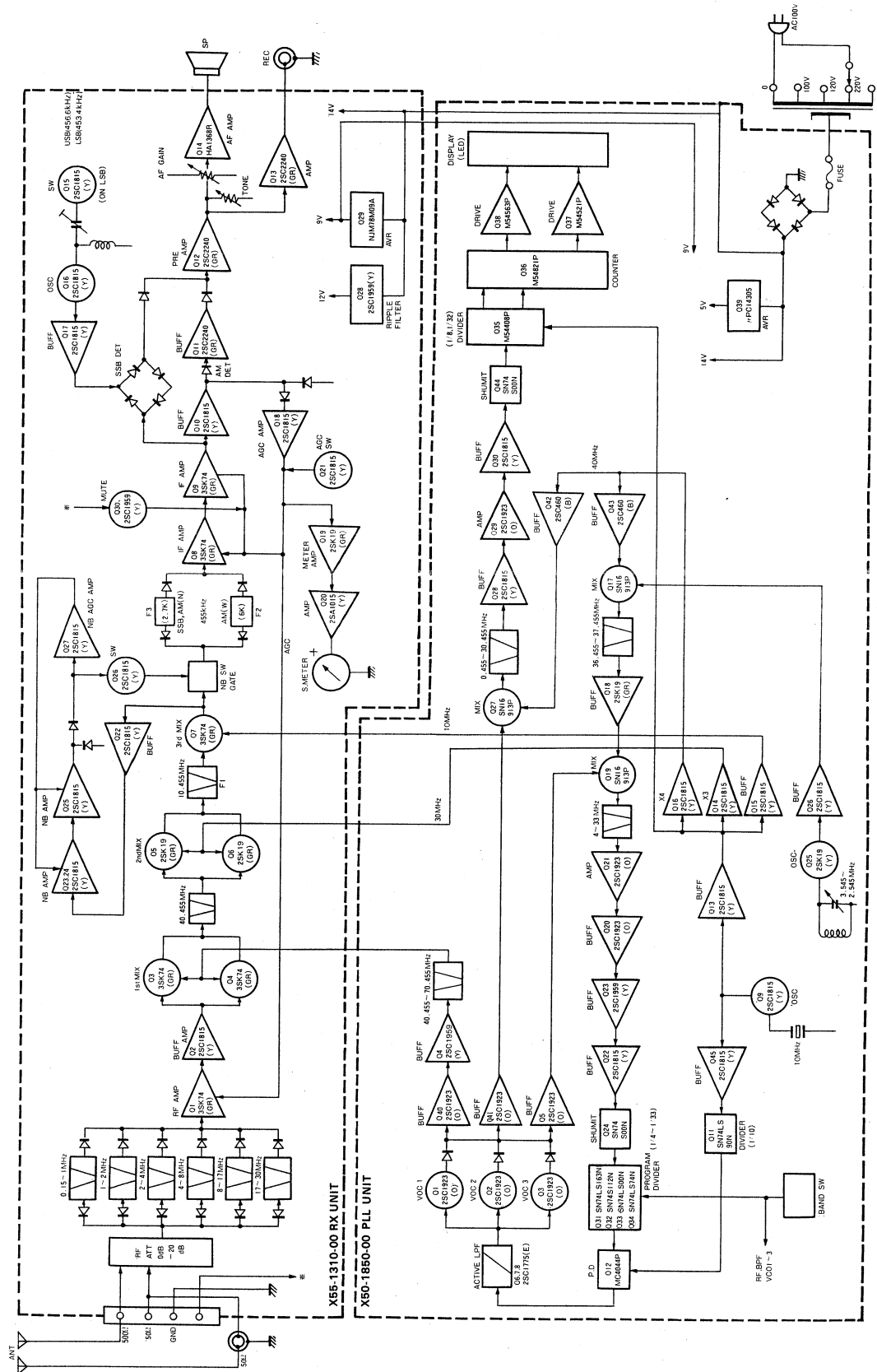


PLL UNIT (X50-1850-XX)

BOTTOM VIEW



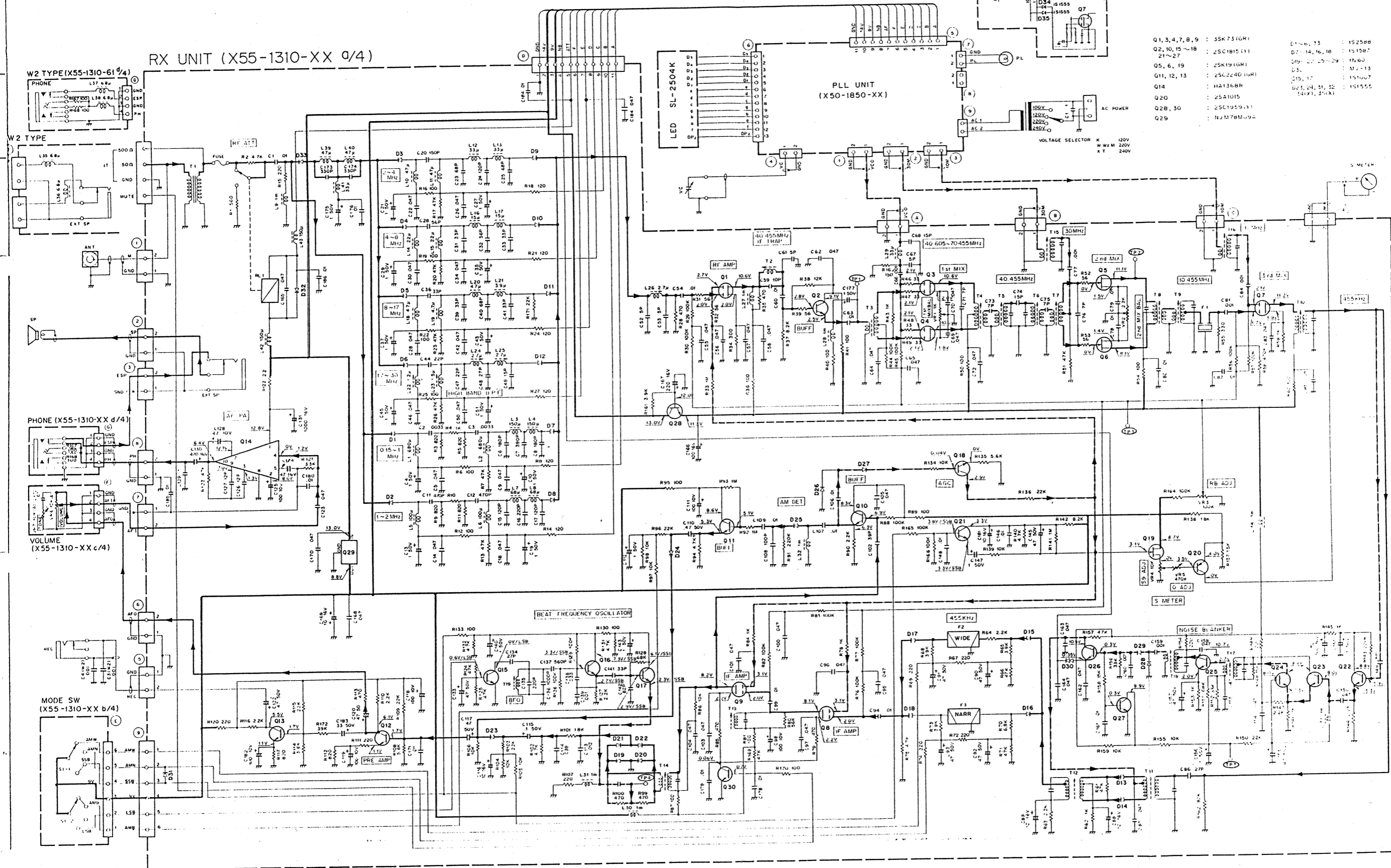
BLOCK DIAGRAM



The picture is shown K type 120V.

SCHEMATIC DIAGRAM

R-600



Voltage measurement conditions.
 f = 14.5 MHz
 MODE: AM WIDE
 No signal

NOTE: Circuit and ratings may change without notice due to developments in technology.

TERMINAL FANCTIONS

Connector No.	Pin No.	Pin Name	Function	Connector No.	Pin No.	Pin Name	Function
PLL UNIT (X50-1850-XX)							
(1)	1	VCO	VCO output, the first mixer local oscillator frequency.		8	NB	RX unit NB circuit – switching information output
	2	GND			9	9V	9V DC input
(2)	1	30M	30 MHz output, the second mixer local oscillator frequency.		10	14V	13.8V DC output
	2	GND			11	GND	
(3)	1	10M	10 MHz output, the third mixer local oscillator frequency.	(6)	1	D5	LED SL-2504K digit output (LSD)
	2	GND			2	D4	LED SL-2504K digit output (LSD)
(4)	1	VC	VFO variable capacitor hot line		3	D3	LED SL-2504K digit output (LSD)
	2	GND			4	D2	LED SL-2504K digit output (LSD)
(5)	1	A	RX unit RF circuit BPF – A information output (0.15 to 1 MHz)		5	D1	LED SL-2504K digit output (MSD)
	2	B	RX unit RF circuit BPF – B information output (1 to 2 MHz)		6	S-e	LED SL-2504K segment output e
	3	C	RX unit RF circuit BPF – C information output (2 to 4 MHz)		7	S-d	LED SL-2504K segment output d
	4	D	RX unit RF circuit BPF – D information output (4 to 8 MHz)		8	S-c	LED SL-2504K segment output c
	5	E	RX unit RF circuit BPF – E information output (8 to 17 MHz)	(7)	9	S-g	LED SL-2504K segment output g
	6	F	RX unit RF circuit BPF – F information output (17 to 30 MHz)		10	S-b	LED SL-2504K segment output b
	7	ATT	RX unit ATT relay – switching information output		11	S-a	LED SL-2504K segment output a
					12	S-f	LED SL-2504K segment output f
					13	DP2	LED SL-2504K decimal point output
				(8)	1	GND	
					2	PL	S meter pilot lamp output
				(9)	1	GND	
					2	14D	DC power input
						AC1	14V AC input
						AC2	14V AC input
RX UNIT (X55-1310-XX-a/4)							
(1)	1	GND			2	GND	
	2	ANT	UHF connector connection	(B)	1	30M	30 MHz input, the second mixer local oscillator frequency.
(2)	1	GND			2	GND	
	2	SP	Built-in speaker output	(C)	1	10M	10 MHz input, the third mixer local oscillator frequency.
(3)	1	GND			2	GND	
	2	ESP	External speaker signal input	(D)	1	GND	
(4)	1	GND			2	14V	13.8V DC input
	2	SM	S meter ouput		3	9V	9V DC output
(5)	1	GND			4	NB	NB circuit switching information
	2	AFO	Detector output		5	ATT	ATT relay switching information
(6)	1	GND			6	F	RF circuit BPF – F information input (17 to 30 MHz)
	2	REC	Sound recording output		7	E	RF circuit BPF – E information input (8 to 17 MHz)
(7)	1	GND			8	D	RF circuit BPF – D information input (4 to 8 MHz)
	2	AFI	AF amplifier input		9	C	RF circuit BPF – C information input (2 to 4 MHz)
(8)	1	GND			10	B	RF circuit BPF – B information input (1 to 2 MHz)
	2	PH	AF power amplifier output		11	A	RF circuit BPF – A information input (0.15 to 1 MHz)
(9)	1	AMW	AM wide mode information input				
	2	AMN	AM narrow mode information input				
	3	SSB	SSB mode (USB) information input				
	4	9V	9V line				
	5	LSB	SSB mode LSB information input				
	6	AMB	AGC time constant switching information input				
(A)	1	VCO	VCO input, the first mixer local oscillator frequency.				
MODE SW UNIT (X55-1310-XX-b/4)							
(F)	1	AMB	AGC time constant switching information output		4	SSB	SSB mode (USB) information output
	2	LSB	SSB mode LSB information output		5	AMN	AM narrow mode information output
	3	9V	9V line		6	AMW	AM wide mode information output
VOLUME UNIT (X55-1310-XX-c/4)				PHONE UNIT (X55-1310-XX-d/4)			
(F)	1	GND		(G)	1	GND	
	2	AFI	AF control input		2	ESP	External speaker signal output
	3	GND			3	GND	
	4	AFO	AF control input		4	PH	AF power amplifier output line